PROPOSED DATA COMPRRSS1ON SCHEMES FOR THE GALILEO S-BAND CONTINGENCY MISSION *

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ABSTRACT

The Galileo spacecraft is currently on its way to Jupiter and its moons. in April 1991, the high gain antenna (HG A) failed to deploy as commanded. in case the current efforts to deploy the HGA fails, communications during the Jupiter encounters will be through onc of two low gain antenna (LGA) on an S-band (2.3 Ghz) carrier. A lot of effort has been and will be conducted to attempt to open the HG A. Also various options for improving G alileo's telemetry downlink performance arc being evaluated in the event that the HG A will not open at Jupiter arrival. Among all viable options the most promising and powerful onc is to perform image and non-image data compression in software onboard the spacecraft. This involves in-flight re-programming of the existing flight software of G alileo's Command and 1)ata Subsystem processors and Attitude and Articulation Control Systcm (AACS) processor, which have very limited computational and memory resources. in this article wc describe the proposed data compression algorithms and give their respective compression performance.

The planned image compression algorithm is a 4 x 4 or an 8 x 8 multiplication-free integer cosine transfrom (ICT) scheme, which can be viewed as an integer approximation of the popular discrete cosine transform (DCT) scheme. The implementation complexity of the ICT schemes is much lower than the I)CT-based schemes, yet the performances of the two algorithms arc indistinguishable.

The proposed non-image compression algorithm is a I,empel-Ziv-Welch (LZW) variant, which is a 1oss1css universal compression algorithm based on a dynamic dictionary lookup table, Wc developed a simple and efficient hashing function to perform the string search.

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